

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table IX, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

Thunderstorms.—One hundred and forty-eight reports of thunderstorms were received during the current month as against 192 in 1897, and 333 during the preceding month.

The dates on which the number of reports of thunderstorms for the whole country were most numerous were: 22d, 40; 20th, 32; 3d, 11; 4th, 11.

Reports were most numerous from South Carolina, 21; Georgia, 18; New Jersey, 18; North Carolina, 18.

Auroras.—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four preceding and following the date of full moon, viz, from the 23d to the end of the month.

The greatest number of reports were received for the following dates: 13th, 10; 12th, 6; 18th, 4.

Reports were most numerous from Minnesota, 9; Montana, 8; Ohio, 7.

In Canada.—Auroras were reported as follows: Father Point, 15; Quebec, 6, 18; White River, 14, 28; Winnipeg, 14; Minnedosa, 8, 11, 14, 16, 17, 18, 19; Qu'Appelle, 14, 17, 18; Banf, 14; Prince Albert, 9; Battleford, 14, 16.

NOTES ON THE WEATHER OF THE WEST INDIES.

No serious atmospheric disturbances were observed during the month. Generally tranquil weather, characteristic of the Tropics, was noted at all stations.

Thunderstorms were observed as follows: Colon, 11th; Roseau, 25th; Santo Domingo, 29th.

Rain from clear sky.—The observer at Dominica reports the occurrence of a heavy shower with clear sky overhead about noon of the 16th. His explanation of the phenomenon is that the rain was blown from clouds overhanging the hills near by.

Water temperatures.—The observer at Porto Rico records in his daily journal a number of observations upon the temperature of the water of the bay and ocean near San Juan made on December 16.

The observations were taken at the surface, and the resulting temperature is closely the mean temperature of the air for the year (79°), and considerably higher than the mean temperature for the past week, (76.0°.)

It is interesting to find that the temperature of the long, narrow, black-bottomed channel of San Antonio is the same as that of the open bay. It connects the bay with the small, open harbor of San Antonio where the temperature was higher. It is surprising to find the open mouth of San Antonio warmer than the large bay of San Juan, and the open mouth of the latter colder. The mouths are only 2½ miles apart. San Antonio has heavy reefs outside, but a heavy surf rolls up to the very mouth and small vessels can enter it.

While the sun was unclouded (from 1:10 to 2:29) the air was 1.7° warmer than the water, but when it clouded (from 2:33 to 3:24) it was 2.4° colder.

Summed up, the observations give the following results:

In San Juan Bay proper	10	observations, mean	78.2
In San Antonio channel	6	"	78.2
In San Antonio harbor	3	"	78.3
At mouth of San Antonio harbor with open sea pouring in. (The depth here is about 10 feet.)	3	"	78.9
Near the mouth of San Juan Bay..	2	"	78.0
At mouth of San Juan Bay (off Morro Castle) in the main channel, which is deep	3	"	77.5

CLIMATE AND CROP SERVICE.

By JAMES BERRY, Chief of Climate and Crop Service Division.

The following extracts relating to the general weather conditions in the several States and Territories are taken from the monthly reports of the respective sections of the Climate and Crop Service. The name of the section director is given after each summary.

Rainfall is expressed in inches.

Alabama.—The mean temperature was 42.0°, or 2.5° below normal; the highest was 78°, at Bermuda on the 21st, and the lowest, 8°, at Madison on the 14th. The average precipitation was 3.58, or 0.12 below normal; the greatest monthly amount, 8.25, occurred at Elba, and the least, 1.51, at Hamilton.—*F. P. Chaffee.*

Arizona.—The mean temperature was 40.4°, or 4.6° below normal; the highest was 84°, at Champies Camp on the 1st, and the lowest, 21° below zero, at Holbrook on the 13th. The average precipitation was 1.73, or 0.07 above normal; the greatest monthly amount, 5.80, occurred at Tuba, and the least, 0.16, at Music Mountain.—*W. G. Burns.*

Arkansas.—The mean temperature was 39.5°, or 3.9° below normal, the highest was 76°, at Texarkana on the 29th, and the lowest, 4° below zero at Keesees Ferry on the 14th. The average precipitation was 1.87, or 2.89 below normal; the greatest monthly amount, 3.68, occurred at Mossville, and the least, 0.56, at Dallas.—*E. B. Richards.*

California.—The mean temperature was 44.4°, or 2.3° below normal; the highest was 98°, at Tropico on the 2d, and the lowest, 12° below zero, at Boca on the 30th. The average precipitation was 1.20, or 2.77 below normal; the greatest monthly amount, 6.07, occurred at Crescent City, while none fell at Chino.—*W. H. Hummon.*

Colorado.—The mean temperature was 19.5°, or 7.0° below normal; the highest was 68°, at Cheyenne Wells on the 28th, and the lowest, 40° below zero, at Garnett on the 31st. The average precipitation was 0.86, or about 0.14 below normal; the greatest monthly amount, 4.18, occurred at Santa Clara, and the least, 0.08, at Delta.—*F. H. Brandenburg.*

Florida.—The mean temperature was 57.5°, or 3.5° below normal; the

highest was 90°, at Ocala on the 3d, and the lowest, 21°, at Crawfordville on the 27th. The average precipitation was 4.12, or 1.32 above normal; the greatest monthly amount, 11.80, occurred at St. Andrews Bay, and the least, 1.89, at Manatee.—*A. J. Mitchell.*

Georgia.—The mean temperature was 46.6°, or 2.7° below normal; the highest was 80°, at Mauzy on the 30th, and the lowest, 8°, at Diamond on the 15th and at Tallapoosa on the 13th. The average precipitation was 3.79, or 0.18 above normal; the greatest monthly amount, 6.98, occurred at Fort Gaines, and the least, 0.60, at Cartersville.—*J. E. Marbury.*

Illinois.—The mean temperature was 26.8°, or 3.9° below normal; the highest was 64°, at Equity on the 29th and at Cairo and New Burnside on the 30th; the lowest, 12° below zero, at Scales Mound on the 14th. The average precipitation was 1.38, or 0.82 below normal; the greatest monthly amount, 2.78, occurred at Tuscola, and the least, 0.34, at Lanark.—*C. E. Linney.*

Indiana.—The mean temperature was 28.8°, or 4.2° below normal; the highest was 66°, at Marengo on the 19th, and the lowest, 26° below zero, at Cambridge City on the 14th. The average precipitation was 2.23, or 0.53 below normal; the greatest monthly amount, 3.59 occurred at Knightstown, and the least, 0.60, at Valparaiso.—*C. F. R. Wap-penhans.*

Iowa.—The mean temperature was 18.1°, or about 5.0° below normal; the highest was 60°, at Wapello on the 29th, and the lowest, 25° below zero, at Estherville, Mason City, and Ruthven on the 31st. The average precipitation was 0.48, or more than 1.00 below normal; the greatest monthly amount, 1.70, occurred at Eldora, and the least, trace, at Mason City.—*G. M. Chappel.*

Kansas.—The mean temperature was 27.8°, or 6.0° below normal; the highest was 66°, at Marion on the 27th, at Oswego on the 28th, and at Fort Scott on the 30th; the lowest was 23° below zero, at Achilles on the 31st. The average precipitation was 1.73, or 0.72 above normal; the greatest monthly amount, 3.62, occurred at Lebo, and the least, 0.29, at Achilles.—*T. B. Jennings.*

Kentucky.—The mean temperature was 34.1°, or 4.2° below normal; the highest was 70°, at Ashland on the 30th, and the lowest, 12°

below zero, at Eubank on the 14th. The average precipitation was 2.74, or 0.53 below normal; the greatest monthly amount, 4.57, occurred at Caddo, and the least, 1.31, at Irvington.—*H. B. Hersey.*

Louisiana.—The mean temperature was 47.4°, or 5.2° below normal; the highest was 80°, at Jennings on the 20th, and the lowest, 11°, at Oxford on the 10th. The average precipitation was 3.03, or 1.19 below normal; the greatest monthly amount, 7.33, occurred at Port Eads, and the least, 1.56, at Montgomery.—*A. G. McAdie.*

Maryland and Delaware.—The mean temperature was 35.0°, or 1.5° below normal; the highest was 70°, at Pocomoke City, Md., on the 4th and 22d, and the lowest, 20° below zero, at Deepark, Md., on the 15th. The average precipitation was 3.54, or 1.04 above normal; the greatest monthly amount, 6.26, occurred at Smithsburg, Md., and the least, 1.85, at Boettcherville, Md.—*F. J. Walz.*

Michigan.—The mean temperature was 23.1° or 3.4° below normal; the highest was 54°, at Fairview on the 18th and at Mottville on the 29th, and the lowest, 35° below zero, at Humboldt on the 31st. The average precipitation was 1.87, or 0.25 below normal; the greatest monthly amount, 3.62, occurred at Ivan, and the least, 0.25, at Port Austin.—*C. F. Schneider.*

Minnesota.—The mean temperature was 11.9°, or about 2.5° below normal; the highest was 54°, at Two Harbors on the 17th, and the lowest, 57° below zero, at Pokegama on the 31st. The average precipitation was 0.18, or about 0.50 below normal; the greatest monthly amount, 0.64, occurred at Pokegama, while none fell at St. Cloud.—*T. S. Outram.*

Mississippi.—The mean temperature was 43.5°, or more than 5.0° below normal; the highest was 78°, at Waynesboro on the 2d and at Natchez on the 30th, and the lowest, 7°, at Ripley on the 13th. The average precipitation was 2.09, or about 1.50 below normal; the greatest monthly amount, 5.78, occurred at Biloxi, and the least, 1.34, at Louisville.—*W. T. Blythe.*

Missouri.—The mean temperature was 28.8°, or 5.9° below normal; the highest was 74°, at New Palestine on the 29th, and the lowest, 20° below zero, at Eldon on the 14th. The average precipitation was 1.69, or 0.68 below normal; the greatest monthly amount, 3.55, occurred at Lebanon, and the least, 0.50, at Downing.—*A. E. Hackett.*

Montana.—The mean temperature was 20.8°, or 3.5° below normal; the highest was 64°, at Utica on the 26th, and the lowest, 37° below zero, at Kipp on the 31st. The average precipitation was 0.41, or 0.21 below normal; the greatest monthly amount, 1.89, occurred at Marysville, and the least, trace, at Darby.—*E. J. Glass.*

Nebraska.—The mean temperature was 23.5°, or about 2.0° below normal; the highest was 83°, at Fort Robinson on the 20th, and the lowest, 22° below zero, at Lodgepole on the 8th and at Camp Clarke and Hay Springs on the 9th. The average precipitation was 0.32, or about 0.35 below normal; the greatest monthly amount, 1.72, occurred at Auburn, while none fell at several western stations.—*G. A. Loveland.*

Nevada.—The mean temperature was 25.3°, or about 5.0° below normal; the highest was 70°, at Panaca on the 1st, and the lowest, 15° below zero, at Elko on the 24th. The average precipitation was 0.48, or 0.81 below normal; the greatest monthly amount, 2.40, occurred at Lewers Ranch, and the least, trace, at Bunkerville, Hot Springs, and Panaca.—*R. F. Young.*

New England.—The mean temperature was 26.4°, or 1.3° below normal; the highest was 58°, at Boston, Mass., on the 30th, and the lowest, 30° below zero, at Fairfield, Me., Berlin Mills, N. H., and Woodstock, Vt., on the 14th. The average precipitation was 2.43, or 1.08 below normal; the greatest monthly amount, 8.30, occurred at Jacksonville, Vt., and the least, 0.75, at Burlington, Vt.—*J. W. Smith.*

New Jersey.—The mean temperature was 33.3°, or 0.9° below normal; the highest was 66°, at Toms River and Oceanic on the 30th, and the lowest was 2° below zero, at Riverdale on the 14th. The average precipitation was 3.53, or 0.42 above normal; the greatest monthly amount, 4.85, occurred at Bridgeton, and the least, 2.38, at Deckertown.—*E. W. McGann.*

New Mexico.—The mean temperature was 28.6°, or 6.4° below normal; the highest was 75°, at Eddy on the 1st, and the lowest, 30° below zero, at Buckmans on the 22d. The average precipitation was 1.19, or 0.29 above normal; the greatest monthly amount, 2.62, occurred at Folsom, and the least, 0.40, at Bluewater and Santa Fe.—*R. M. Harding.*

North Carolina.—The mean temperature was 42.1°, or 0.5° below normal; the highest was 75°, at Newbern and Sloan on the 20th, and the lowest, 4° below zero, at Linville on the 15th. The average precipitation was 2.74, or 1.01 below normal; the greatest monthly amount, 5.69, occurred at Highlands, and the least, 1.09, at Murphy.—*C. F. von Herrmann.*

North Dakota.—The mean temperature was 12.1°, or 1.0° below normal; the highest was 55°, at Ellendale and Forman on the 28th, and the lowest, 38° below zero, at Woodbridge on the 31st. The average precipitation was 0.27, or 0.24 below normal; the greatest monthly amount, 0.87, occurred at Forman, and the least, trace, at Buxton, Melville, Steele, and Willow City.—*B. H. Bronson.*

Ohio.—The mean temperature was 28.8°, or 3.6° below normal; the highest was 67°, at Clarksville on the 29th, and the lowest, 18° below zero, at McArthur and Milligan on the 14th. The average precipitation was 2.71, or about normal; the greatest monthly amount, 4.64, occurred at Ashtabula, and the least, 1.02, at Annapolis.—*J. Warren Smith.*

Oklahoma.—The mean temperature was 34.7°; the highest was 77°, at Fort Sill on the 29th, and the lowest, 2° below zero, at Prudence on the 23d. The average precipitation was 2.73; the greatest monthly amount, 5.20, occurred at Pawhuska, and the least, 1.88, at Tahlequah.—*J. I. Widmeyer.*

Oregon.—The mean temperature was 34.4°, or 3.5° below normal; the highest was 70°, at Prineville on the 1st, and the lowest was 10° below zero, at Silverlake on the 12th. The average precipitation was 4.00, or 2.96 below normal; the greatest monthly amount, 16.51, occurred at Nehalem, and the least, 0.28, at Riverside.—*B. S. Pague.*

Pennsylvania.—The mean temperature was 29.8°, or 2.2° below normal; the highest was 68°, at Warren on the 30th, and the lowest, 11° below zero at Dyberry on the 14th. The average precipitation was 2.98, or about 0.16 below normal; the greatest monthly amount, 4.79, occurred at Somerset, and the least, 1.31, at Franklin.—*T. F. Townsend.*

South Carolina.—The mean temperature was 49.5°, or 2.4° below normal; the highest was 77°, at Gillisonville on the 20th, and the lowest, 9°, at Walhalla on the 13th, and at Greenville and Holland on the 15th. The average precipitation was 2.84, or 0.30 below normal; the greatest monthly amount, 6.52, occurred at Gillisonville, and the least, 1.02, at Cheraw.—*J. W. Bauer.*

South Dakota.—The mean temperature was 19.2°, or about 3.0° below normal; the highest was 64°, at Chamberlain on the 28th, and the lowest, 29° below zero, at Ladelle on the 13th. The average precipitation was 0.14, or 0.74 below normal; the greatest monthly amount, 1.10, occurred at Fort Meade, and the least, trace, at several stations.—*S. W. Glenn.*

Tennessee.—The mean temperature was 37.4°, or about 3.5° below normal; the highest was 71°, at Yukon on the 30th, and the lowest, 8° below zero, at Springdale on the 14th. The average precipitation was 2.56, or more than 1.00 below normal; the greatest monthly amount, 4.20, occurred at McKenzie, and the least, 1.00 at Liberty.—*H. C. Bate.*

Texas.—The mean temperature for the State, determined by comparison of 32 stations, well distributed, was 9.3° below the normal, which shows that December, 1898, was an exceptionally cold month. The deficiency in temperature at the several stations ranged from 3.0° to 13.9°, with the greatest over the northeastern portion of the State. The highest temperature was 92°, at Fort Ringgold on the 1st, and the lowest, 2° below zero, at Tulia on the 10th. The average precipitation for the State, determined by comparison of 31 stations distributed throughout the State, was 0.06 below the normal. There was a slight excess over west Texas and the central portion of the coast district, and nearly normal conditions prevailed elsewhere, except over southwest Texas, and the eastern and western portion of the coast district, where there was a slight deficiency, with greatest, 1.75, over the east coast district. The greatest monthly amount, 4.08, occurred at Brenham and at Jacksonville, and the least, trace, at Fort Ringgold and Point Isabel. Snow was reported from all stations except over the extreme southern portion of the State, and traces fell at Galveston on the 9th, 10th, and 14th. The greatest local amount was 10.5 inches at Tulia.—*I. M. Cline.*

Utah.—The mean temperature was 23.3°; the highest was 72°, at Ferron on the 1st, and the lowest, 17° below zero, at Fort Du Chesne on the 30th and 31st. The average precipitation was 0.64; the greatest monthly amount, 1.85, occurred at Thistle, and the least, trace, at Tropic.—*J. H. Smith.*

Virginia.—The mean temperature was 38.3°, or about 1.7° below normal; the highest was 74°, at Spottville on the 21st, and the lowest, 2° below zero, at Marion on the 14th. The average precipitation was 3.02, or 0.06 below normal; the greatest monthly amount, 6.10, occurred at Columbia, and the least, 1.35, at Hampton.—*E. A. Evans.*

Washington.—The mean temperature was 31.0°, or nearly 6.0° below normal; the highest was 71°, at Kennewick on the 26th, and the lowest, 13° below zero, at Usk on the 13th. The average precipitation was 3.97, or 2.50 below normal, and is the least December precipitation on record; the greatest monthly amount, 18.05, occurred at Clearwater, and the least, 0.06, at Sunnyside.—*G. N. Salisbury.*

Wisconsin.—The mean temperature was 15.5°, or 4.9° below normal; the highest was 60°, at Prairie du Chien on the 16th, and the lowest, 40° below zero, at Osceola on the 31st. The average precipitation was 0.39, or 0.73 below normal; the greatest monthly amount, 1.75, occurred at Bayfield, while none fell at Spooner.—*W. M. Wilson.*

Wyoming.—The mean temperature was 17.4°, or 6.4° below normal; the highest was 60°, at Hecla on the 14th, and at Sheridan and Wheatland on the 28th; the lowest was 30° below zero, at Bigpiny on the 9th. The average precipitation was 0.64, or 0.03 below normal; the greatest monthly amount, 2.50, occurred at Sherman, while none fell at Bigpiny.—*W. S. Palmer.*